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U. S. DEPARTMENT OF AGRICULTURE.

REPORT

OF THE

ACTING CHIEF OF THE BUREAU OF BIOLOGICAL SURVEY

FOR

1906.

BY

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ACTING CHIEF.

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REPORT OF THE CHIEF OF THE BUREAU OF BIOLOGICAL SURVEY.

U. S. Department of Agriculture,
Bureau of Biological Survey,
Washington, D. C., August 1, 1906.

Sir: I have the honor to submit herewith a report of the work of the Biological Survey for the fiscal year ended June 30, 1906, with outline of work for 1907, and recommendations for 1908.

Respectfully,

Henry W. Henshaw,
Acting Chief.

Hon. James Wilson, *Secretary.*

WORK OF THE YEAR.

The work of the Biological Survey is prosecuted along the lines laid down by Congress, as follows: (1) Investigations relating to the geographic distribution of animals and plants, including biological surveys and the determination of the life and crop belts; (2) investigations of the economic relations of birds and mammals to agriculture; (3) supervision of matters relating to game preservation and protection and the importation of foreign birds and animals.

The work of the Biological Survey began July 1, 1885. Its first investigations were in the field of economic ornithology, and were undertaken as a branch of the Division of Entomology. The following year the Survey was established as the Division of Economic Ornithology and Mammalogy. After twenty years' service as a Division, on July 1, 1905, by act of Congress, the Biological Survey was made a bureau. While this change of status brought no radical change in the character of the work of the Survey, it made possible a more efficient organization. This was effected under three heads:

(1) Geographic Distribution, in charge of Vernon Bailey. The office of Geographic Distribution has charge of field and office work relating to the collection, preparation, and elaboration of specimens and information illustrating the status and geographic distribution of North American animals and plants. It is engaged also in mapping the ranges of mammals, birds, reptiles, and plants, and the preparation of reports thereon. (2) Economic ornithology and mammalogy, in charge of A. K. Fisher. The office of Economic Investigations has charge of field and laboratory work relating to the food habits of mammals and birds, and of the collection of seeds and insects and other objects belonging thereto; also of the preparation of reports on the economic relations and food habits of birds and mammals. (3) Game preservation and protection, in charge of T. S. Palmer. The

office of Game Protection has charge of matters relating to the preservation, protection, and introduction of game and other animals, and of matters coming under the jurisdiction of the Department by reason of the Lacey Act.

The administrative assistant, H. W. Henshaw, has charge of the correspondence, business, and business office of the Biological Survey, including the photographic laboratory, and of all editorial and clerical work. In the absence of the Chief, the administrative assistant is the Acting Chief, and has general supervisory authority over all the work of the Biological Survey.

GEOGRAPHIC DISTRIBUTION.

LIFE ZONES AND CROP ZONES.

Early in the history of the Survey it was recognized that a close relation existed between the natural live zones of the country and the crop zones, and much time and attention has since been given to the collection of data bearing upon the subject.

It is well known that the plants, birds, mammals, and reptiles of different regions differ widely, and that the transition from one natural geographic area to another is often abrupt. Naturally these changes, whether abrupt or gradual, are accompanied by corresponding variations in the availability of the areas for different crops. Careful study of these areas has demonstrated that they result from differences in climatic conditions, and that the country can be divided into well-marked life and crop zones in accordance therewith. Up to the present time maps have been published showing the life zones of North America as a whole, of the United States, and of Texas and parts of New Mexico and Arizona, and lists have been published of the crops best adapted for cultivation in each zone. The detailed work necessary for the preparation of zone maps of the several States is being carried on as rapidly as funds permit, with the end in view that each farmer wherever located shall have a practical guide to the fruits, forage crops, and general crops that can be most successfully grown on his own ranch.

Scientifically valuable as such maps are, they are even more important from an economic point of view, and those already published have been widely utilized by agricultural experiment stations and for general educational purposes.

During the year work has been continued in California and adjoining areas and in New Mexico, Colorado, Wyoming, and South Dakota.

California.—Field work in California, physiographically the most diversified and complicated of the States, was continued during the early part of the year by the Chief of Bureau and three assistants, and will be continued during the coming season. A vast amount of material on the distribution of the mammals, birds, reptiles, and woody plants of the State has been already gathered and elaborated for the final report.

During previous years the Survey had done considerable work in the arid desert region of southern California and Arizona. In view of the extensive development by irrigation now in progress in this region it was considered important to secure further data and to carry the work southward over the adjoining desert region of Lower Cali-

fornia. For this purpose, in the spring of 1905, E. W. Nelson and E. A. Goldman, field naturalists of the Survey, were sent to southern California, and, after work in that region, continued south and made a reconnaissance survey of the peninsula of Lower California.

Texas.—A report on the life and crop zones, mammals, and reptiles of Texas, by Vernon Bailey, illustrated by a zone map of the State and numerous special maps, was published during the year. Full notes on the habits and relations of various mammals to agriculture in Texas, where such species as the coyote and prairie dog do enormous damage to farmers and stock raisers, are a feature of this report. Unfortunately the edition was so small that it was soon exhausted. It is hoped that it will be possible to issue a second edition of sufficient size to at least supply the demand from residents of the State.

A report on the birds of Texas, by H. C. Oberholser, will be completed as early as practicable. It will contain all available information on the relation of birds to agricultural interests, which are so important in this great State, and will throw much light on the problems of distribution.

New Mexico.—Field work in eastern New Mexico has been nearly completed by Vernon Bailey, and in western New Mexico has been carried on by Bailey, assisted by N. Hollister, and will be continued. The life zones have been mapped for the Zuñi, San Mateo, Datil, and Gallinas mountains, and intervening country. This completes the detailed zone map for more than half of the Territory.

Colorado.—Field work in northern Colorado by Merritt Cary resulted in a detailed zone map of a broad belt from Denver and Boulder to the Grand and Yampa river valleys, over a complicated area of high mountains and parks, steep slopes, and deep, fertile valleys. From Colorado Mr. Cary made a trip into the Bad Lands of South Dakota in continuation of work already begun in that State.

Alaska.—Field work in Alaska was suspended during the year, W. H. Osgood, in charge of this work, remaining in Washington in order to prepare his accumulated notes for publication and do other necessary office work.

Mackenzie Basin.—E. A. Preble has practically completed the reports on his extensive field work in the Mackenzie River region, and is engaged in mapping the distribution of the mammals, birds, and forest trees. The results are of the greatest importance in connection with the work of the Survey in Alaska.

Distribution of ducks and geese.—The principal work of Prof. W. W. Cooke, temporary assistant in charge of bird migration, has been in connection with a report on the "Distribution and migration of North American ducks, geese, and swans." This has been completed and is now ready for publication. Another bulletin, on the "Distribution and migration of North American shore birds," is about half completed. This will serve as a basis for practical legislation in relation to shore birds as the other will to ducks.

Bird migration work.—During the year the usual spring and fall migration schedules have been sent to and received from field observers and filed for future use.

The work of copying, classifying, and making available the notes

contributed by migration observers has been continued and the work is now up to date. While the number of migration observers has not increased largely of late, there has been a noticeable and welcome improvement in the character of the reports, and the Survey is rapidly accumulating a series of accurate observations from single localities which will serve as a basis for valuable conclusions regarding the phenomena of migration in the United States.

IDENTIFICATION OF BIRDS AND MAMMALS.—In addition to the regular work of this branch of the Survey the task of identifying specimens of birds and mammals for colleges and museums thruout the country has grown until it occupies much time. This work, however, yields much valuable data on distribution, and thus is of distinct advantage to the Survey.

ECONOMIC ORNITHOLOGY AND MAMMALOGY.

The increasing importance of all branches of agriculture in the United States and the value of the products of the soil are being augmented from year to year by leaps and bounds. Irrigation is making available to the farmer and orchardist many thousand acres of land hitherto of little or no value, and a systematic search is being conducted in foreign countries for useful plants suitable for transplanting to American soil, with the result that many valuable varieties have already been introduced. Along with new fruit and forage plants new insect pests are continually finding their way into the United States, either by extension of range from contiguous regions or by means of commerce. As large tracts of heretofore wild land are brought under cultivation, the rodents that inhabit them become troublesome factors, more particularly as the abundance of new food in the shape of cultivated cereals enables them to multiply much more rapidly than was possible when dependent upon the more scanty larder of unassisted nature. As a result of the changed conditions, invasions of new insect pests and inroads of noxious mammals are frequent and often disastrous.

As the acreage under cultivation is extended and as the number of destructive insects increases, more and more importance attaches to the study of the economic status of birds. A knowledge of the species which can be relied upon to aid the farmer in his constant warfare against pests is necessary as a basis for legislation for the protection of the friendly species; and the discovery of preventive methods against injurious species is equally essential.

The study of our common mammals also is important. Some of these, formerly classed as noxious, are now found to be beneficial, because their food has been ascertained to consist largely of insects. Others, especially certain rodents, are known to be directly injurious, and as larger crops are raised and the animals multiply with the added food supply, the amount of damage is correspondingly great, hence the necessity for the discovery and utilization of more effective and cheaper methods of controlling these pests.

PREVENTIVE MEASURES AGAINST MAMMALS.—Experiments with poisons to destroy coyotes, rabbits, rats, and mice have been in progress during the year and will be continued. Experiments with fences to protect sheep from coyotes are now in progress, in cooperation with

flock owners in the West, and others have been planned, but have been delayed for lack of funds. These, as well as experiments with fences to protect nurseries and certain garden crops from rabbits, will be continued during the coming year.

In connection with the depredations of rabbits, experiments with a view to the protection of newly planted trees have been undertaken in cooperation with the Forest Service. An attempt is being made by the Forest Service to reforest upward of a hundred thousand acres of the San Gabriel Forest Reserve in southern California. This tract abounds in small rabbits, and in places these rodents have destroyed as high as 30 per cent of the seedlings, thus necessitating repeated and costly replantings. As attempts to destroy the animals by ordinary means have proved both expensive and inadequate, the Forest Service has requested the cooperation of the Biological Survey. A method has been devised of protecting the seedlings by cheap wire screens, and these in connection with practical methods of poisoning will, it is believed, go far to solve the problem.

Wolves.—Gray wolves are still numerous in the West and in certain sections are so abundant that they cause much loss to ranchmen and farmers. Their large size and strength make them formidable enemies of calves and colts and even of full-grown animals. The problem of ridding the forest reserves and cattle range of gray wolves was taken up by the Biological Survey at the request of and in cooperation with the Forest Service. An experienced field naturalist was detailed for the work and visited parts of Wyoming and New Mexico for the purpose of determining the extent of the losses in live stock and game, and of studying the methods most effective in destroying wolves. A preliminary bulletin on the subject has been prepared by this assistant, and is to be published by the Forest Service for distribution to forest rangers, ranchmen, hunters, and trappers in the wolf-infested regions.

The protection of stock on the western ranges and of wild game in the forest and game preserves from the depredations of wolves, coyotes, panthers, and other carnivorous animals is of such growing importance that it is intended, if funds are available, to employ assistants acquainted with the habits of these animals to visit the several reserves and contiguous stock ranges for the purpose of devising methods for the destruction of the animals.

Bacterial diseases.—A comparatively new field of research in our country is the study of diseases of a bacterial character, cultures of which may be preserved indefinitely, for the purpose of destroying noxious animals.

It has been known for a long time that many, if not all, of the small rodents that live in colonies or exist in great numbers within limited areas are subject from time to time to epidemic diseases which so decimate their numbers as to practically eliminate them as disturbing factors of agriculture till they have had time to again increase abnormally.

It was not until recent years, during which the study of bacterial diseases received great impetus, that the nature of such epidemics and the possibility of isolating, propagating, and utilizing the bacilli for destroying noxious mammals has been appreciated. Such diseases appear often to be limited to particular species or to a group of closely related species, and hence are harmless to man and to domestic ani-

mals. Only, however, after careful experiments to determine their nature and limitations can the employment of such diseases for the purpose suggested be recommended.

For several years studies of bacterial diseases have been carried on in European countries for the purpose of discovering a virus which could be used as an effective ally in warring on rodent pests. Several such cultures have recently been placed on the market, and the Biological Survey is now engaged, in cooperation with the Bureau of Animal Industry, in testing the efficacy of one of these—for which much is claimed in Europe—for the purpose of employing it against certain American mammals, especially rats and field mice.

Of vastly more importance, however, are investigations recently begun by the Survey to ascertain the causes, nature, and effects of local diseases known to occur at irregular periods among American rabbits, prairie dogs, ground squirrels, and other rodents.

Among the most troublesome of these animals are the ground squirrels, several species of which are very destructive to crops in many parts of the West, notably in Washington, Oregon, Idaho, and California. In eastern Washington two species (*Citellus columbianus* and *C. townsendi*) do enormous damage, the annual loss from these rodents and the expenses of repressive methods in a single county reaching upwards of half a million dollars.

The bacillus of a disease fatal to one of the above species was discovered some years ago by Prof. C. V. Piper and Dr. S. B. Nelson, then connected with the experiment station at Pullman, Wash. Cultures were made in the laboratory and experiments were conducted with a view to the utilization of the virus in destroying the animals in the wheat fields, but the work was not completed owing to lack of the necessary funds. The work has been taken up by the Biological Survey in cooperation with the State experiment station at Pullman, and experiments are now being conducted with every promise of successful results. It is hoped eventually to secure a virus which can be utilized on a large scale to destroy the rodents which now levy so severe a tax on the wheat crops of the Northwest.

Confidence is felt that the discovery and isolation of the bacilli responsible for fatal diseases in the case of rabbits, prairie dogs, field mice, and other noxious rodents is entirely practicable, and it is hoped that funds for the necessary investigations will be made available. By a comparatively small outlay it is thought that methods can be devised to introduce fatal diseases among noxious mammals by means of which their numbers can be so reduced as to render them practically harmless to farming interests.

In connection with these investigations a circular has been prepared and distributed to experiment stations and farmers and stockmen in the western States for the purpose of eliciting information as to the presence of epidemic diseases among rodent mammals. It is hoped by this means to secure information in time to obtain cultures for preservation and future use.

Cooperative work.—For the prosecution of the laboratory work necessary in connection with these experiments the cooperation of the Bureau of Animal Industry has been obtained. Doctor Melvin has kindly consented to aid the Survey to the utmost extent possible, and at his instance Dr. Marion Dorset, in charge of the Biochemic Division,

has conducted laboratory experiments with a commercial virus imported from France with a view to ascertaining its efficacy in destroying certain small American mammals. He has undertaken, also, to preserve in the laboratory cultures of the bacillus, now being experimented with on ground squirrels in Washington, so that its preservation for immediate use is assured.

The importance of the work above outlined and the necessity for extensive field experiments conducted over a term of years renders cooperation with State experiment stations particularly desirable. Arrangements have been made with the Washington Experiment Station, as stated above, to conduct cooperative experiments on ground squirrels, or spermophiles, and it is hoped that as the work progresses similar arrangements can be made with stations in other States where the damage from various mammals presents a very serious problem.

Examination of bird stomachs.—As in previous years, field and laboratory work on the food habits of birds has been carried on simultaneously. A large number of stomachs was received during the past year from various parts of the United States, and the analysis and tabulation of their contents far exceeded the capacity of the small force engaged in the work. It is hoped that an increase of funds during the coming year will enable additional assistants to be employed, when the work will be pushed as vigorously as its importance demands.

Professor Beal, chief assistant in this branch of the work, spent several months of the present year, and will occupy a considerable part of the coming season, in studying the food habits of birds in the fruit districts of California and Oregon with a view to discovering means of altogether preventing or greatly restricting the damage to the olive, grape, cherry, and other fruit crops of these States. A preliminary report upon the damage by birds in the garden and orchards of California by Professor Beal, with suggestions for remedial measures, has been completed and will be published during the coming year.

Geese.—From time immemorial California has been a favorite resort for waterfowl, and many thousands of geese of several species annually winter within the State. As the grassy plains, where they formerly fed, were converted into wheat fields the birds transferred their attention from the succulent grasses to the more nutritious cereals. So destructive are the geese in certain sections that the problem of protecting the grain from their ravages is a serious one and necessitates large outlay.

The simplest and most direct method of protection is the destruction of the geese by means of the rifle and shotgun. This plan requires the services of several men on each ranch, and is not only expensive, but objectionable, in so far as it necessitates the slaughter of valuable food birds with practically no return other than the protection of grain. Wild fowl are a valuable asset, both as an article of food and as a source of revenue from sportsmen; hence they should be protected when their protection is not incompatible with more important interests.

The preservation of geese in California is the more important, as this State is one of the birds' last strongholds. In the Eastern States geese are becoming fewer and fewer each year, and their practical extinction there can not be far distant.

During the present year Doctor Fisher visited California in connection with this problem, and will continue investigation during the present season with a view to the discovery of methods of protecting the grain fields without unnecessary destruction of the geese.

Cotton-boll weevil.—Investigations of the relations of birds to the cotton-boll weevil was continued during the past year. Field work in connection with the problem was conducted in Texas during the greater part of 1905, and about 2,000 birds' stomachs were examined for the purpose of ascertaining what species are most serviceable in destroying this pest. One hundred and eight individuals of 12 species were found to have eaten the weevil. Of these, orioles proved to be the greatest destroyers of the pest, as many as 41 weevils having been found in the stomach of a single oriole. The nighthawk also was discovered to be an enemy of the weevil, and further investigations will probably prove that during certain times of year these birds perform extremely valuable service in destroying the pest, and hence should be carefully protected. The list of birds ascertained to feed on the weevil now numbers 28. A bulletin in the nature of a report of progress on this work, by A. H. Howell, has just been issued.

North American eagles.—A report upon the North American eagles and their economic relations has been completed by H. C. Oberholser and will shortly be published. In it the food habits of these birds are given in detail, and their economic status is fully discust with a view to determining the extent of protection, if any, that should be afforded them. They are found to be beneficial in some regions and their protection there is recommended. In other regions they are found to be injurious and protection may safely be withheld.

Food of wild ducks.—The food of wild ducks in its relation to their migration and the establishment of a proper open season continues a subject of investigation. Difficulty is experienced in obtaining a sufficient number of stomachs of these birds, especially from unrepresented territory, for definite determination of their food, and final results are likely to be delayed for this reason. So far 520 stomachs have been examined.

Grosbeaks.—The work on the economic relations of the grosbeaks is being continued and is nearing completion. A bulletin on this important group of birds—noted for feeding on the Colorado potato beetle and on scale insects—will probably be issued during the present year.

Means of attracting birds.—An important phase of bird increase and protection is the planting of berry-bearing trees and shrubs about the home and orchard. An increased food supply naturally tends to an increased number of birds, and the planting about orchards and gardens of berry-bearing shrubs—important as bird food, but worthless to man—makes directly for the protection of valuable fruit. There are many such trees and shrubs, the fruit of which is preferred by our native birds to the larger cultivated kinds which derive added value from their ornamental character. This subject is receiving constant attention and a bulletin will be forthcoming at an early day.

During the year 5,638 bird stomachs were received and 2,236 were examined and their contents tabulated.

GAME PROTECTION.

Acting under the provisions of law requiring the Secretary to collect and publish useful information in regard to game birds and to adopt such measures as may be necessary to carry out the provisions of the Lacey Act, the office of Game Protection endeavors to keep in touch with all efforts to protect or propagate game in the United States and to a certain extent in other countries. To this end constant communication is maintained with game officials, State and private organizations, directors of zoological parks, and private individuals in this country and abroad. Aid is given to measures for the preservation of game, and attempts are made to promote cooperation between the authorities of the several States and also between these and the Department. Its efforts are divided between this educational work and the purely administrative duties assigned it, such as (1) supervision of the importation of foreign wild animals and birds; (2) cooperation in the enforcement of provisions of the law governing interstate commerce in game and educational work, such as securing, filing, and publishing information concerning important subjects in game-protection matters; (3) administration of the Federal bird reservations, and (4) the protection of game in Alaska.

IMPORTATION OF FOREIGN MAMMALS AND BIRDS.

During the year 433 permits were issued for the entry of foreign wild mammals and birds and 5 for the entry of eggs for propagation. Under these permits 654 mammals, 274,914 canaries, 47,383 miscellaneous birds, and 5,564 pheasant eggs were brought into the United States. In addition to these, there were imported 1,636 mammals, 2,696 canaries, and 11,040 miscellaneous birds, for which no permit was necessary.[a] The number of entries was larger than in any previous year, in spite of the fact that no importations were received at San Francisco subsequent to April 18, 1906, the date of the earthquake. Last year 390 permits were issued, under which were imported 178 mammals, 230,682 canaries, 27,957 miscellaneous birds, and 2,270 eggs.

The total number of species of birds represented in the year's importations was 344. A few of these were game birds for stocking covers, but by far the larger part consisted of birds for confinement as pets, specimens for exhibition, and public zoological collections.

The law prohibiting the entry of certain birds and mammals likely to prove serious pests is becoming more generally known, and during the year no noxious species were offered for entry, nor did strict surveillance disclose any attempt to introduce them surreptitiously. One of the few known specimens of mongoose in captivity in the United States, that in the National Zoological Park, died on June 2, 1906.

PHEASANTS.—The importation of pheasants for zoological parks and private aviaries included 15 Cabot, 10 Temminck, and 2 horned tragopans, 8 monaul or impeyan pheasants, 2 black-backed kaleeges, 8 Siamese pheasants, 2 of the rare Hoki pheasants, and 1 rufous-tailed pheasant (*Gennæus erythrophthalmus*), apparently the first of this species brought into the country.

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[a] Exclusive of packages of mammals and birds, chiefly monkeys, parrots, and pigeons, the exact number of individuals in which was not stated.

Miscellaneous cage birds and mammals.—Among the interesting importations for exhibitions and private collections were 11 beaver from Canada; 2 echidnas from Australia; 2 black-footed penguins from Australia; 4 painted quail from China; 2 green-billed toucans from Guiana; 3 cayenne rails from Brazil; 2 Madagascar porphyrios (gallinules); 1 ostrich from Somaliland; 4 keas, 4 weka rails, and 4 kiwis, flightless birds from New Zealand; 10 of the rare rosy-billed ducks from South America; 11 African edelsingers; and 10 masked waxbills from Africa. It is interesting to note an increase in the importation of the attractive shama thrushes from India, of which 58 were imported during the year.

Eggs.—The poor success attending previous efforts to import the eggs of game birds for hatching in this country seems to have exercised a discouraging influence, and few such importations were made. The most important was the entry of 5,500 pheasant eggs from Liverpool, England, about the 1st of June, 1906, by the game commissioner of Illinois. Of this shipment only 8 eggs were broken in transit and 10 more in unpacking. One thousand eight hundred and nine eggs were infertile, and further losses were incurred from various other causes, but from the 5,500 eggs 3,000 live, healthy chicks were secured. It remains to be seen what percentage of these attain maturity.

Inspection.—For several years much dissatisfaction has been shown by importers with the payment of fees and with other details of the inspection service. This feeling culminated in an appeal to the Board of Appraisers at New York late in 1905. The appeal was dismissed by the Board for lack of jurisdiction, but the Department has since removed the cause of complaint by placing the inspection service upon a more satisfactory basis. On February 1, 1906, it temporarily assumed the payment of fees and established an office in New York City, from which an inspector may always be obtained at short notice. With the service as now reorganized, the Department has eleven inspectors, distributed as follows: Two each at Boston, New York, San Francisco, and Baltimore, and one each at Philadelphia, New Orleans, and Honolulu. In the absence of a specific appropriation for inspection service it is possible to examine only the most important shipments, the great majority of which are entered at New York and Philadelphia. It is highly desirable that inspections should be made at San Francisco, and to a limited extent at Boston and New Orleans, and that more of the shipments at New York and Philadelphia should be examined. Under the fee system the entire service could be put on a substantial basis at a cost not to exceed $1,000 per annum. The necessity for this check on the introduction of noxious birds and animals is amply demonstrated by the experience of other countries, where the mongoose and other injurious species have gained a foothold. The incalculable injury done by these pests and the constant danger of their intentional or unintentional importation into the United States makes the expense of a rigid inspection service insignificant in comparison with the losses which are sure to follow ill-advised and unchecked importation. The introduction and spread of the English sparrow shows the importance of taking every precaution against the entry of other pests which might prove even more destructive.

GAME BIRDS FOR PROPAGATION.—As the supply of native game birds diminishes, the importation of birds from foreign countries for stocking covers assumes greater importance. Among the importations of the year were 864 European partridges, chiefly for stocking private preserves, and 81 capercailzie, 50 black game, 30 willow grouse, and 15 hazel grouse for liberation on Grand Island, Mich. The Massachusetts game commission imported 8 capercailzie and 12 black game for liberation, and 27 capercailzie and 11 black game were brought in for various other destinations, chiefly private preserves. Fourteen bamboo partridges were imported from China for the State of Washington last July and from recent reports seem to be doing well.

The depletion of quail covers by recent severe winters has resulted in vigorous efforts in various parts of the country to secure birds from sections where they still abound. The quail of Mexico were drawn on, and 148 bobwhite and 2,400 Mexican quail were imported and shipped to northern points. These proved unsatisfactory and native quail were sought to meet the demand. Owing, however, to the strict and comprehensive nonexport laws of most of the States, the supply of available birds has been far below the demand, and consequently the stock of quail in those States from which the birds could be legally secured has been recklessly diminished; in other States violations or evasions of the law have occurred. In Alabama a few shippers furnished eastern and northern States with enormous numbers of quail, which it is by no means certain will be able to withstand the climate of the regions where the birds were liberated. A similar attempt to meet the demand was made in Texas, where, however, the State law was violated, and the quail trappers were arrested and confined in jail.

Despite these strenuous efforts to supply the demand, and despite all attempts to meet the deficiency by proper and moderate transfer of domestic birds, the demand continued greatly in excess of the supply. If such depletion recurs, better methods will have to be devised to restore the normal abundance. To stock one part of the country at the expense of another without careful safeguards to prevent depletion of the covers drawn upon is mistaken policy. The supply should be taken from a number of points to avoid too great a drain on limited localities, and all trapping and export of birds for propagation should be under State control and not left to unchecked individual enterprise.

Before the demand for quail can be satisfied, means must be devised whereby the birds can be propagated profitably on a commercial scale. It is estimated that during the past year Alabama furnished about 100,000 quail, and the West and Southwest 50,000 more. Prices ranged from $4 to $5 per dozen for southern birds, and $10 a dozen for those from the Southwest. Thus, all told, $75,000 to $100,000 worth of quail were required for a partial supply of the existing demand. Severe winters are likely to recur, and even under favorable climatic conditions, excessive hunting and the rapidly increasing number of game preserves will create a constant demand for birds for propagation. Already quail have been raised in confinement in an experimental way, but with varying success. All the difficulties have not yet been overcome, but they are not insuperable, and it is to be hoped that State or private enterprise may successfully meet them at no distant date.

HAWAII.—Thirteen permits were issued for the entry of 9 mammals, 15 birds, and 1 lizard at Honolulu during the year, imported chiefly from Australia, China, and Japan. In June, 1905, a consignment of rattlesnakes was received from San Francisco. These snakes were designed for public exhibition in a small zoological collection. They were promptly destroyed by the inspector at Honolulu, and, in reponse to strong public sentiment, former restrictions on entries into Hawaii were extended to cover all snakes, instead of poisonous ones alone.

INTERSTATE COMMERCE IN GAME.

Seven cases of violation of the interstate-commerce provisions of the Lacey Act have been reported to the Department during the year and six are still pending. Two of these cases involved the illegal shipment of 133 ducks and 1 grouse from North Dakota; one, shipment of 6 prairie chickens from South Dakota; and two, shipment of 313 quail from Oklahoma. The other two cases originated in West Virginia. One of them related to unlawful transportation of quail by a mail carrier on the route from Capon Bridge, W. Va., to Winchester, Va., and upon a report of the facts to the Postmaster-General an investigation was made, which resulted in doing away with the traffic. The other was based on the seizure of a shipment of ruffed grouse en route to Baltimore.

Convictions were secured in two cases on indictments filed in previous years, one involving the shipment of quail from Oklahoma and the other prairie chickens from Vilas, S. Dak.

Conditions in the Middle West, where violations of this character have been most frequent, have undergone marked change during the past year. Consignments at Chicago and St. Louis have greatly decreased in number, and shippers are now resorting to means other than the express to reach the market. The steady restrictions of sale and shipment, and the consequent diminution of profit have reduced the importance of these shipments, and attention is now directed mainly to the problem of discovering and dealing with the novel methods of evading the law practised in the Southwest. In some of the Eastern States and in the South illegalities also require special consideration. Reports are frequently received of shipments of quail, ruffed grouse, and other game to the markets of Washington, Baltimore, and Philadelphia from points in Virginia and adjoining States in violation of the Federal law, but efforts to prevent such shipments thus far have not been successful.

BIRD RESERVATIONS.

Four new bird reservations have been established by Executive order during the year, namely, Huron, Siskiwit, and Passage Key Reservations in the fall of 1905 and Indian Key Reservation early in 1906.

The table on page 15 presents a convenient summary of the seven reservations thus far established.

Bird reservations established to June 30, 1906.

Reservation.	Location.	Area (approximate).	Date of order.
Pelican Island	Indian River, Florida	5 acres	Mar. 14, 1903
Breton Island	Group of 3 islands in Gulf of Mexico, off coast of Louisiana.	Unknown	Oct. 4, 1904
Stump Lake	4 islands, Nelson County, N. Dak	28 acres	Mar. 9, 1905
Huron Islands	5 islands off south shore of Lake Superior, Michigan	Unknown	Oct. 10, 1905
Siskiwit Islands	South of Isle Royale, Lake Superior, Michigan.	do	do
Passage Key	Mouth of Tampa Bay, Florida	36 acres	do
Indian Key	do	Unknown	Feb. 10, 1906

These islands are small, low, swampy, or rocky and of no value for agricultural purposes. They are the breeding or winter resorts of large colonies of useful or interesting birds, and in setting them aside as reservations the United States is carrying out a policy which has been adopted in Australia, New Zealand, Canada, the British Colonies in Africa, and other parts of the world. Warden service is maintained on these islands in cooperation with the National Association of Audubon Societies, and the good results are already apparent. The only known breeding colony of brown pelicans on the east coast of Florida now has assured protection and is showing a gratifying increase, and the establishment of Breton Island reservation has preserved thousands of wild ducks from slaughter.

Pelican Island Reservation.—Nesting was begun early in November, 600 nests having been constructed by November 18. By the end of the year many young were hatched and the colony seemed in a prosperous condition, but about the middle of February the young began to die and in a few days 600 or 700 of them perished. Unfortunately a request to the warden to forward some of the birds for examination was received too late. Prof. William L. Underwood, of the Massachusetts Institute of Technology, who was present on the island, dissected one of the dead birds. He found no evidence of disease, and it is probable that the mortality was due to cold and exposure to inclement weather. About 150 young survived and by the 1st of April were able to fly. On April 15 the old birds began to nest again, and by May 5 the second broods began to hatch. Two hundred nests were occupied and about 400 young raised in this second nesting.

Breton Island Reservation.—The ducks wintering on this reservation were protected from attacks of market hunters, and the royal, Wilson, and Cabot terns successfully bred on some of the islands in the summers of 1905 and 1906. The president of the Audubon Society of Louisiana reports that while on a tour of inspection in June, 1906, he found that on this reservation and the Audubon reservation, maintained on the adjoining coast by the Louisiana Audubon Society, fully 100,000 terns were reared during the present season.

Stump Lake Reservation.—The value of setting aside certain tracts where absolute protection is accorded to bird life has been emphasized by the fact that Stump Lake Reservation not only affords protection to the birds that nest there, but during the open season has proved a haven of refuge to birds driven from their usual resorts in the vicinity.

Huron Islands Reservation.—Five small unsurveyed islands, situated in Lake Superior, 4 miles from the south shore, are occupied as a breeding place by about 700 gulls and a few mergansers. From 1,200 to 1,500 young gulls and a few mergansers were hatched in the summer of 1905.

Siskiwit Islands Reservation.—All of the unsurveyed islands lying near the mouth of Siskiwit Bay on the south side of Isle Royale in Lake Superior compose the Siskiwit Islands Reservation, which, like the Hudson Islands Reservation, is a breeding place for gulls. These two reservations contain the most extensive breeding colonies of herring gulls in the interior.

Passage Key Reservation.—Passage Key Reservation comprises an island near the mouth of Tampa Bay, and is frequented by large numbers of terns, ducks, cormorants, brown pelicans, and other birds. Among the birds present in January were some 3,000 Florida cormorants, 5,000 red-breasted mergansers, 3,000 royal terns, and 1,000 tree swallows. Among the May birds, many of which were probably nesting, were approximately 5,000 Louisiana herons, 8,000 terns of various kinds, and 100 brown pelicans.

Indian Key Reservation.—Indian Key Reservation is situated in Tampa Bay, about 5 miles northeast of Passage Key. It is a breeding place and winter resort for herons, cormorants, terns, and other sea birds.

Protection from Trespass.—Occasional difficulty has been experienced in protecting some of these reservations from trespass, but Congress has recently passed an act (approved June 29, 1906) making it a misdemeanor to hunt or trap birds on bird reservations, wilfully disturb them, or take their eggs. This act will materially aid the Department in preventing such depredations.

BIG GAME REFUGES.

The transfer to the Sequoia National Park of part of the herd of dwarf elk, presented to the Government by Miller & Lux some years ago, was successfully accomplished in November, 1905. About 20 of the animals were captured on the Button Willow ranch, transferred by rail to the station nearest the park, and placed in the inclosure constructed for them in 1904. The elk now in the park form the nucleus of a new herd which, with adequate protection and the favorable surroundings afforded by the park, it is hoped may insure the preservation of this fine species.

The New York Zoological Society generously offered 15 or 20 buffalo to the Department on condition that a suitable range be inclosed for them on the Wichita Game Preserve in Oklahoma. This new preserve, situated in the midst of the former natural range of the buffalo, affords an ideal location for the establishment of a herd under Government auspices, but it was impossible to accept this offer at once on account of lack of an appropriation for fencing the proposed range. The matter was presented to Congress and an item was included in the current appropriation bill providing $15,000 for the construction of the necessary fence under the supervision of the Forest Service.

PROTECTION OF GAME IN ALASKA.

Conditions under the Alaska game law remain practically unchanged, and the close supervision of exports and the restricted issue of permits have been continued. Special restriction of the export of trophies from the Kenai Peninsula has been maintained for several seasons on account of the danger threatening the game because of the accessibility of the region and its peculiar attractiveness to sportsmen in search of big game. During the past year the issue of permits was confined mainly to the open season, and early in the spring was temporarily suspended. Comparatively few permits were granted, chiefly to residents of Alaska desiring to bring home a few heads for their own use.

The question of the shipment of trophies has proved the most troublesome feature of the law and has given rise to considerable dissatisfaction. The question is complicated by the occurrence on the Kenai Peninsula of the largest species of moose in the world, the heads of which are greatly sought as trophies. Horns having a spread of 72 inches or more command fabulous prices, which makes head hunting one of the chief objects both of sportsmen and natives. Every device is employed to obtain permits to bring out moose heads, and no means of checking this traffic have been devised, except the unsatisfactory expedient of prohibiting all shipments from the Kenai Peninsula.

The permits issued may be divided into three groups—those for shipment of trophies, those for collecting specimens for scientific purposes, and those for capture of live game intended for propagation or exhibition. According to the records of this office 204 permits have been issued since the passage of the law in 1902, as shown in the following table:

Number of permits issued for the shipment of trophies and specimens from Alaska.

Year ending June 30—	Trophies.	Scientific specimens.	Propagation.	Not used or canceled.	Total.
1903	34	12	2	13	[a]61
1904	43	8	0	16	67
1905	12	4	3	9	28
1906	23	8	1	16	[b]48
Total	112	32	6	54	204

[a] Two duplicate numbers. [b] One duplicate number.

The total number of permits for export of trophies was 112 and for export of scientific specimens 32, or an average of 28 and 8, respectively. The number issued during the past fiscal year was 23 for trophies, 8 for scientific specimens, and 1 for live birds (for the New York Zoological Park). These figures, however, are greatly in excess of the number of permits actually used. The Department has direct knowledge that 54, or more than 25 per cent of the total number issued, were canceled or remain unused, and as the reports of the collector of customs at Seattle, where most of the Alaska shipments are received, show the receipt during the entire four years of only 47 consignments (35 of trophies and 12 of specimens), it is evident that many permits remain unused of which no direct information has been

received. In the past year, with 32 permits outstanding, the number of consignments received at Seattle was only 10, of which 4 were heads forwarded for mounting to be returned to Alaska and 1 was a head in transit from British Columbia. It is evident, therefore, that in spite of the frequent demand for permits and the great pressure brought to bear on the Department in order to secure them, comparatively few are actually used.

To relieve the Department of much unnecessary criticism a transfer of the issue of permits to some convenient point in the Territory where, when necessary, conditions can be readily investigated, seems desirable. It is hoped that this matter will be considered by the next Congress, and that the present law will be modified.

INFORMATION CONCERNING GAME.

Many requests are received for information concerning game and game protection. Among the most important was one in connection with an effort to maintain the law prohibiting the sale of imported game in close season in the State of New York. Such sales have already been practically stopt in the District of Columbia, and in Minnesota, New York, Ohio, Wisconsin, and other States. The question was taken up with State officers in California, Colorado, Illinois, Indiana, Minnesota, Nebraska, New Jersey, and Ohio, and data were obtained which proved of material assistance in connection with the measure under consideration.

In response to a request received from the Massachusetts State Game Association, similar information was furnished concerning the sale of game from the West in the markets of Boston. The necessity was clearly shown of restricting the sale of such game in Massachusetts to the open season, in order to prevent evasion and violation of the Federal law and the laws of the States from which the shipments were made.

Wisconsin has recently past a law placing deputy game wardens under the civil service and requiring applicants for the position to take competitive examinations. In the adoption of this important step in the administration of the local law the State warden asked for suggestions from the Department, which, in response to the request, recommended certain subjects and conditions which might advantageously be incorporated in such examinations. Requests are frequently received from game officials and associations for information, personal conference, or representation at meetings. Such requests are complied with whenever possible, and during the year personal consultations were had with State officials of California, Idaho, Illinois, Indiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Jersey, New York, North Carolina, Ohio, Tennessee, Virginia, West Virginia, Wisconsin, and Wyoming. Many of these were held at the meeting of the National Association of Game Wardens at St. Paul, in January, 1906, which afforded an opportunity for conference with a number of State officers of the Northwest.

Considerable progress has been made during the year on the index of game laws and the bibliography of game literature mentioned in the last report. A complete index of the laws of Missouri and California, covering more than half a century, was added to the work already done in indexing State laws; and several of the more important

serials, together with some of the current foreign game laws, have been examined for material for the bibliography. The index of decisions on game laws, which was undertaken at the request of the National Association of Game Wardens, has been nearly completed. The plan of the work was submitted to the association at the annual meeting in January, 1906, and received the approval of the committee appointed to examine it. As soon as additions suggested by the committee have been incorporated, the index will be prepared for publication.

Owing to greatly increased interest in the game-refuge idea and because of pending legislation on the subject by Congress, it was deemed desirable to investigate methods of establishing and maintaining game refuges in other countries. Data have been collected respecting the game refuges of Canada; of Denmark and Norway in Europe; of British East Africa, Cape Colony, Natal, Sudan, and the Transvaal in Africa; and some of the States of Australia. Information has been secured also concerning methods of preserving moose or elk practised in Sweden for the past one hundred and fifty years.

The usual summary of State game laws affecting seasons, shipment, and sale was issued, as well as posters showing close seasons for game in the United States and Canada. As many of the close seasons in North Carolina were changed by a revisal of the laws of that State, which was published too late to be incorporated in either bulletin or poster, a special poster was issued showing the close seasons of North Carolina as modified by the revisal.

While, as stated, information and assistance have been promptly furnished whenever possible in response to the numerous demands made on the office, on the other hand, it is a pleasure to state that ready and hearty cooperation has been met with from game officials and organizations of the United States and other countries, railroad and express companies, and many private individuals.

ROUTINE WORK.

As the field work of the Survey increases and new lines of investigation are undertaken, the amount of routine work increases correspondingly. This consists of correspondence, chiefly in the nature of responses to requests for information, preparing reports and bulletins for publication, identifying and labeling specimens, storage and care of field collections, cataloging bird stomachs, tabulating field reports, sorting and filing published matter valuable for reference, mapping distribution of birds and mammals, supplying the needs of field assistants, developing photographic plates and making prints therefrom, compiling game laws, issuing permits for the entry of foreign mammals and birds and for the export of trophies and specimens from Alaska, and cooperation in enforcing the various provisions of the act of Congress of May 25, 1900. The letters received during the year numbered about 4,600, the letters written during the same period numbered about 6,500, and over 700 migration schedules were sent out to observers.

The collection of negatives made in the field for the purposes of study, record, and illustration now numbers about 10,000.

PUBLICATIONS.

The publications for the year include 1 number of North American Fauna, 4 bulletins, 5 circulars, 2 articles in the Yearbook, 1 Farmers'

Bulletin, the Report of the Chief for 1905, and 11 reprints of former publications.

North American Fauna No. 25, by Vernon Bailey, comprises a "Biological Survey of Texas." The Bulletins are entitled: No. 21, "The Bobwhite and Other Quails of the United States in their Economic Relations," by Sylvester D. Judd; No. 22, "Birds Known to Eat the Boll Weevil," by Vernon Bailey; No. 23, "The Horned Larks and their Relation to Agriculture," by W. L. McAtee; No. 24, "The Grouse and Wild Turkeys of the United States and their Economic Value," by Sylvester D. Judd; No. 25, "Birds that eat the Cotton Boll Weevil," by Arthur H. Howell. The Farmers' Bulletin is "Game Laws for 1905; A Summary of the Provisions Relating to Seasons, Shipments, Sale, and Licenses," by T. S. Palmer, Henry Oldys, and R. W. Williams, jr. (No. 230). The articles in the Yearbook are entitled, "Federal Game Protection—a Five Years' Retrospect," by T. S. Palmer; and "Meadow Mice in Relation to Agriculture and Horticulture," by D. E. Lantz. The titles of the circulars are as follows: No. 49, "Directions for Preparing Specimens of Large Mammals in the Field," by C. Hart Merriam; No. 50, "Directory of State Officials and Organizations Concerned with the Protection of Birds and Game," by T. S. Palmer; No. 51, "List of Publications;" No. 52, "Directions for Destroying Pocket Gophers," by D. E. Lantz. In addition, reprints of the following were issued: Bulletin, 1; Farmers' Bulletins, 3; Yearbook articles, 3; circulars, 4.

OUTLINE OF WORK FOR 1907.

GEOGRAPHIC DISTRIBUTION.

Field work in California, New Mexico, Colorado, and South Dakota, to determine the life and crop zones of these States, will be continued during the year on much the same lines as in past years.

General field work in Texas has been practically completed and it is expected that a report upon the birds of the State will be ready during the present year. The publication of a volume, with maps illustrating the life and crop zones of this large and important State, has been planned, but as yet funds will not admit of the final field investigations necessary to determine the crops best adapted to the several faunal areas. It is hoped that provision will be made for this work so that it can be completed during the next field season.

It is planned to send an assistant to Alaska in 1907 to investigate, among other matters, the subject of fox farming, an industry which seems to promise important results.

ECONOMIC ORNITHOLOGY AND MAMMALOGY.

An important part of the work of this branch of the Survey for the coming year will be field investigations of epidemic diseases of rabbits and other rodent pests with a view to the discovery of effective means of destroying them on a large scale and at small cost.

Laboratory and field experiments in cooperation with the Bureau of Animal Industry to test the value of an imported virus in the destruction of field mice and rats will be continued.

The field and laboratory experiments with a bacterial virus for the destruction of spermophiles injurious to grain, in cooperation with

the State experiment station at Pullman, Wash., will be continued on a more extensive scale. Experiments also with this virus will be made to test its efficacy in the destruction of rats.

Two preliminary reports on the relation of birds to the boll weevil in Texas have been issued. The work will be continued in cooperation with the Bureau of Entomology in Texas and will be extended into Louisiana, into which State the weevil has already made its way and where it threatens the same disastrous results which have attended its presence in Texas.

The investigation of the food of California birds with special relation to the protection of orchards and vineyards will be continued during the present year, and a full report thereupon will be issued as soon as the necessary examinations of stomachs can be completed.

Investigations of the food habits of the rose-breasted grosbeak with particular relation to the destruction of the Colorado beetle are practically completed, and a report upon the subject will soon be ready for the press.

A report on the English sparrow, containing an account of its food-habits, methods of breeding and of distribution, together with suggestions for restricting its spread, was published in 1889. Since then, in spite of strenuous efforts to limit its increase, including the offering of bounties in many localities, the pest has greatly increased in numbers and has widely extended its range. Requests for information relative to it are constantly being received, and as the above report has long been out of print it is thought desirable to issue a revised report containing much data accumulated since the date of the former report and bringing the subject up to date.

A preliminary study of the present status of the wolf problem in the Western States, with a view to the discovery of methods for destroying the big gray or timber wolf, has been completed, except that certain work during the fall months is necessary to develop the best methods of trapping at that season. A report on the subject, prepared by the Biological Survey, will be published by the Forest Service.

It is intended to continue experiments for the purpose of preventing or limiting the damage by wolves and coyotes in the West. Coyotes, tho smaller and less formidable than gray wolves, inflict considerable injury, especially to the sheep and poultry industries. Fencing experiments will be continued for the purpose of ascertaining the height and the size of mesh necessary for a coyote-proof fence which can be put up at a cost sufficiently low to render its general use to sheep raisers practicable.

Meadow mice are a perennial source of annoyance and danger to the nursery and orchard, as well as most destructive to pasturage and various crops. Attention will be paid to improving known methods of destroying them by means of poison and traps, as well as to experimenting with a virus for thinning their numbers by disease.

GAME PROTECTION.

IMPORTATION.

Further improvement in the work of supervising importations of foreign animals and birds will be instituted on July 1, 1906, which it is expected will not only facilitate the issue of permits, but will serve

as a further check thereon. A notice of the issue of each permit will be forwarded by the same mail to the collector of customs at whose port the entry is to be made, and at the close of the quarter the original permits will be returned to this Bureau thru the Treasury Department with a report from the collector. In this way each collector will be advised of the permits drawn on his port, and the receipt of the permits by the Department will show which have been used.

The consolidated card index of species imported into the United States begun last year will probably be completed in the course of a few months. It will furnish a record of the wild birds and animals imported since the passage of the Lacey Act of 1900, with the date of entry and number of birds of each species or in any one shipment.

INTERSTATE COMMERCE IN GAME.

Attention will be centered in Oklahoma and the Southwest, where new problems are presented which call for careful and comprehensive investigation. Preliminary arrangements for conducting cooperative work during the open season of 1906 have already been made between the Department and two of the States most intimately concerned. Attention will be given also to the violations of the Federal law frequently reported from the States of Virginia, West Virginia, and North Carolina, and an attempt made to diminish the number of illegal shipments from these States. In this connection the fact can not be too strongly emphasized that the Department has never had the means to properly discharge the duties placed upon it by the Lacey Act. In the absence of adequate appropriation it has been impossible to give this feature of the work the personal supervision it requires, or to organize it on a systematic and thoro basis. In order to carry out properly the provisions relating to interstate commerce in game it is necessary that the territory east of the Rocky Mountains, which supplies most of the game forwarded to eastern markets, be divided into at least three districts, each in charge of a supervisor responsible for maintaining careful scrutiny over the express and freight shipments, and who should be required to investigate reports of violations and cooperate with State officers in obtaining the evidence necessary for the apprehension and prosecution of violators of the law. These districts should be as follows: A northwestern, comprising the States from Michigan to Montana and Ohio to Nebraska, with headquarters at Chicago; a southwestern, comprising the States from Kentucky to Tennessee and Mississippi to Colorado, with headquarters at St. Louis; and a southeastern, comprising the States from Maryland to Alabama, with headquarters at Baltimore. In the past wherever personal aid has been given to State officials excellent results have followed; but, owing to the rigid economy heretofore necessary, it has been impossible to accede to many of the requests for such cooperation. Active and intelligent work on the part of such Federal supervisors would constitute an effective check on illegal shipments of game, would create a wholesome respect for the Federal law prohibiting such shipments, and would enable the Department to handle the cases much more systematically and effectively than is now possible. The services of supervisors for this special work would not be required during the entire year, perhaps for not more than six months (during the open

season for game), but a sufficient sum for traveling expenses should be allowed to enable the supervisors to cover their districts and for special investigations.

GAME REFUGES.

The attention given to Federal refuges in recent sessions of Congress, and the misapprehension on the part of many persons in regard to the subject, indicate the desirability of early publication of all available data on this important subject. An investigation has already been begun, and information will be secured concerning the character and extent of refuges or game preserves in foreign countries, the manner in which they are maintained, and the degree of success which has followed their establishment.

In the past three years seven bird refuges established by Executive order have been placed in charge of the Secretary of Agriculture and their administration has been intrusted to the Biological Survey. In cooperation with the National Association of Audubon Sccieties, warden service has been established on each of these reservations, but to secure the best results and fully attain the object for which these preserves were established, they should be frequently inspected and steps should be taken to protect more effectively the birds nesting on them. A small expenditure for this purpose will yield large returns and make of some of the reserves, such as Pelican Island in Florida, important points of attraction for the States in which they are located.

The private preserves of the United States, which are now numbered by hundreds, and the combined area of which greatly exceeds that of existing Federal preserves, should also be the subject of investigation to ascertain their location and area and the methods under which they are maintained. Some progress in this direction has already been made, but their rapidly increasing number and the lack of means prevent thoro investigation.

COOPERATIVE WORK.

Cooperation with the Forest Service will be continued for the purpose of devising the best methods of increasing the stock of game on the Federal refuges which have been established in Oklahoma and Arizona. Cooperation with the State wardens and commissioners for the purpose of enforcing the provisions of the Lacey Act and restricting the shipment of game in violation of the Federal law will likewise be continued as heretofore. Cooperative work with the New York State library in indexing the game laws will be continued, and it is hoped that before the close of the year all of the States west of the Missouri River will have been covered.

The events of the past spring have demonstrated the necessity of immediately devising means of obtaining game birds, especially quail, for propagation. In cooperation with a committee of the American Breeders' Association it is expected to make at least preliminary investigations to ascertain what has been accomplished in this field, especially in rearing quail, grouse, pheasants, and ducks in captivity or in a state of semidomestication. Consideration will be given also to the possibility of developing certain breeds of pheasants or other game birds adapted to the conditions of the regions that need restocking.

RECOMMENDATIONS.

In submitting estimates for the fiscal year 1908 the following recommendations are made:

(1) That an increase of $2,200 in the statutory roll be granted to be applied as follows: $1,200 for the employment of a stenographer and typewriter whose services are necessary on account of the greatly increased work in the business office of the Bureau; and $1,000 for an additional clerk whose services are needed in the Office of Game Protection.

(2) That an increase of $11,500 in the lump appropriation be granted as follows: For field investigations, chiefly in relation to methods of controlling the ravages of rodent mammals, including studies of epidemic bacterial diseases, $3,000; for field work in locating the boundaries of crop belts and for work on geographic distribution, $1,000; for work in economic ornithology and mammalogy, $1,000; for special investigations in connection with the depredations of wolves, coyotes, and panthers, and other carniverous animals on stock ranges, game refuges, and forest reserves, $2,500; for salaries and traveling expenses on account of supervision of interstate commerce in game, $2,000; for miscellaneous field expenses for Office of Game Protection, $1,000; for the payment of inspection fees on entry of foreign birds and animals, $1,000.

Total increase, $13,700.

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